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Report on the cryophilous Collembola, collected by Dr. S. Kohshima

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The present paper deals with the Collembola collected by Dr. S. Kohshima of the Tokyo University for Industries and Technology during his research tour of glaciology to the snowy region of the world. It is quite surprising to know that there are many tiny creatures within the icy environment burrowing deep in the inside of the glacier, feeding on the blue algae and other minute particles. The result is also interesting to find that such Collembolan genera, hitherto known only from Europe (Pyrenees) and Japan, are to be found from the Patagonian glacier. It is my pleasure, therefore, to express my hearty thanks to him, with some feeling of envy, to be able to travel and work in such a marvellous corner of the earth.

Desoria mazda (Yosii)

Isotoma (*Desoria*) *mazda*. Yosii 1971

NEPAL: Yala glacier, 5300 m. alt. (4 ex. 17. VIII 1985)

The examples coincide well with the previous description. The amendment is that the eyes are 6+6 and not 7+7, one of them being the bleached hole caused by the muscle insertion. Although the species is unusual in outlook for the genus, it was not possible once again to find out any character to establish a different taxon for it.

Desoria saltans Nicolet (Fig. 1)

Desoria saltans: Nicolet 1841

Isotoma saltans: Gisin 1960 etc.

Isotoma sp. G.: Eisenbeis et Meyer 1986

SWITZERLAND: Aletsch glacier (7 ex. 29. VIII 1984), Rohne glacier (7 ex. 26. VIII 1984).

Body length ca. 1.8 mm., deeply black all over, including the extremities, ant/head as 15/10, segm. ratio as 10/16/14/30. Ant. IV is with an apical conical process and a small pin in a groove, but without "pin-seta". The segment is also with many curving sensillae. Ant. III-organ is two rather large sensillae in a shallow groove. Ant. I is ventrally with some 8 small sensillae, derived from the setulae there. Labrum with setae 4/5, 5, 4, labral margin is entire, without structures, but with special median intrusion as observed by Eisenbeis et Meyer, which is still obscurely visible in the light micoscope. Outer max. lobe is with setae 2/II+4, so that papillate seta is not modified and one additional seta is existing. Maxillar head is small, the lamella is hyaline and one of them is fur surpassing the capitulum. Labial papillae

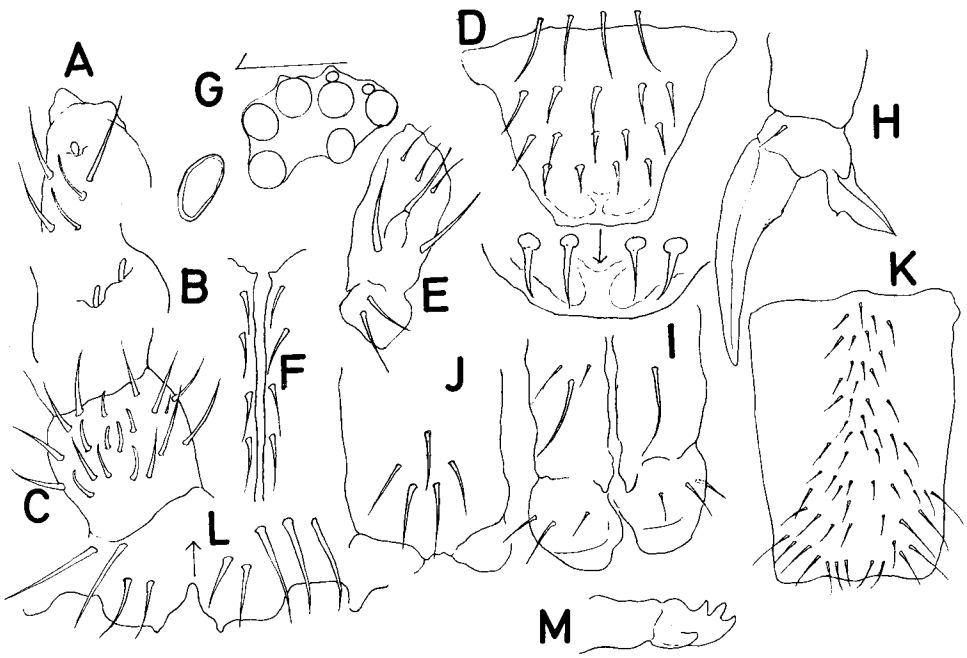

Fig. 1 *Desoria saltans* (Nicolet)
A: ant.Ⅳ, B: ant.Ⅲ-organ, C: ant.Ⅰ (ventral), D: labrum, E: outer max. lobe, F: median groove of mentum, G: eyes and pao. H. hind ciaw, I, J: ventral tube, K: manubrium (ventral), L: distal thickening, M: mucro.

seems to be slightly reduced, but not to formulate exactly. Setae along the median line of mentum 4+4 in number. Eyes 6+6, G, H being reduced to small rudiments. Pao. is rounded, elongate sometimes and its diameter is about 1.5 of the eye. *Area frontalis* is heavily pigmented and setae dispersed almost equidistant to each other. Unguis rather long, with neither dorsolateral nor inner tooth. Unguiculus is with or without an inner tooth. Tenent hair not specialised. Ventral tube very short, deeply pigmented, with 1-3 setae anteriorly on one side, 5 posteriorly and 3-4 on lateral flap. Rami tenaculi quadridentate, corpus with ca. 4 setae. Furca elongate on dens. man/d as 10/35. Manubrium has ventrally the terminal setae 2+2, 3+3 or 3+2, the thickening is with a cusp, which is not freed and other setae are arranged in an elongate triangle. Dorsal terminal setae 1+1, not specialised. Dorsally dens is with ca. 25 setae. Mucro minutely quadridentate, apical and anteapical subequal and the third is smaller and on the dorsal ridge, while the fourth one is to the outer side of mcuro. Body setae are very short, even the longer ones of abd. V are ca. 1/2 of the segment. They are all quite smooth.

For this classical species, known as "Gletscherflöh" from the time of the modern alpinism, no serious description has been made, until it is figured by Eisenbeis and

Meyer with the name of *I.* sp. G. from Oetztal in Tirol, which is exactly the same with the present material of Switzerland. With its reduced number of eyes, maxillary head and entire labral margin as well as by the slender unguis, it is easily to be identified from other species. The morphological difference to *D. nivalis* Carl, 1910 must be studied once again.

***Desoria yukinomi* (Yosii)** (Fig. 2)

Isotoma yukinomi: Yosii 1939

JAPAN: Mt. Tsurugi, Masagozawa, Pref. Toyama (6 ex. 9. VIII 1983), Mt. Hira, Kanakuso Pass, Pref. Shiga (8 ex. 24. XII 1979)

Body length ca. 1.8 mm., bluish black on antennae, head and trunk, including ventral tube, coxae and manubrium. Only distal parts of legs are pale, ant/head as 13/10, segm. ratio as 10/14/13/20. ant.IV is apically with an obtuse, rounded production, but without pin-seta. Ant. III-organ is two small rods in a shallow groove. Setae of ant. I are not modified. Labrum with setae 4/5, 5, 4, labral margin has 4 rounded crenulations. Outer max. lobe with setae 2/II+3 and its main papilla has one setaceous process attached to it. Maxillary head has no lamella exceeding the teeth. Labial setae not specialized. Eyes 8+8, G, H smaller and intensely black. Pao. is broadily elliptical, ca. 1.5 times the eye. Unguis normal, with a pair of dorsolateral and one inner tooth. Unguiculus has one corner tooth on inner side. Tenent hair not differentiated. Ventral tube is short, with only 1+1 setae on anterior side. Posterior side has 4 terminal plus 1−3 small proximal setae. Lateral flap bears some 10 setae. Rami tenaculi quadridentate, corpus with up to 10 setulae. Furca with man/d as 10/23. Manubrium is ventrally with a triangular setiferous area and with 3+3 distal setae, but the third seta is almost confluent with the lateral group. Terminal thickening has a pair of teeth, not freed. Dorsally, the maunbrium is only setaceous, distal 1+1 is the largest. Dens is with many ventral setae. Dorsal crenulations are numerous, but setae are few, almost 10. Mucro quadridentate without mucronal seta. Body setae are all simple, smooth and the longest seta of abd. V is ca. 1.2 times the length of the segment. Abd. V and VI are distinctly separated.

Possibly, the species is widely distributed in Siberia and North America as in case of *Isotoma kisoana* Yosii (=*Granisotoma rainieri* Folsom) as pointed out in Fjellberg 1987, but the available data for the ventral tube etc. are quite limited and not to be compared with the present description.

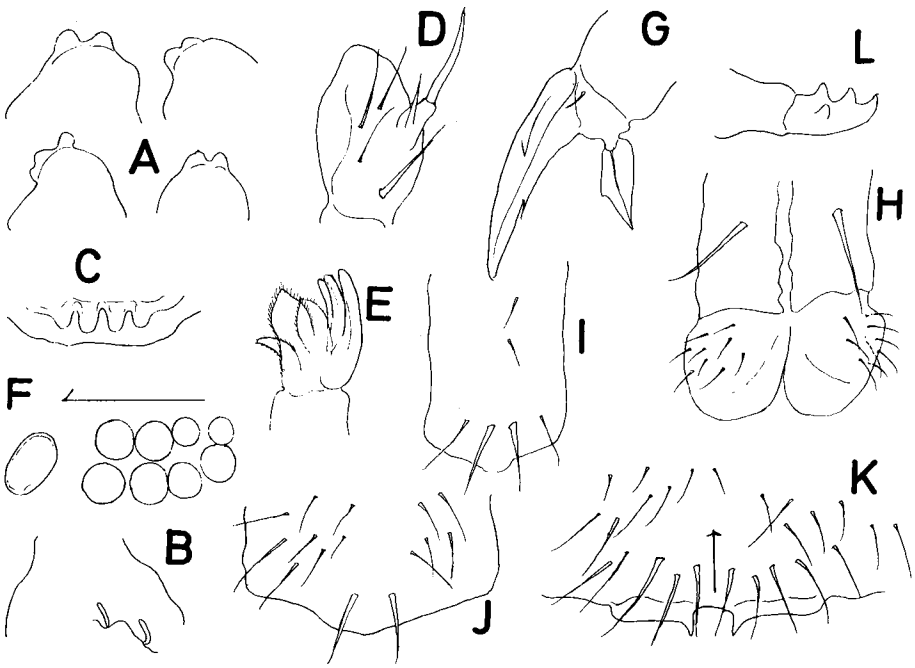

Fig. 2 *Desoria yukinomi* (Yosii)
A: ant. Ⅳ, B: ant. Ⅲ-organ, C: labral margin, D: outer max. lobe, E: maxilla, F: eyes and pao. G: hind claw, H, I: ventral tube, J: distal part of manubrium (ventral), K: ditto (dorsal)

Genus *Pteronychella* Börner, 1909

type species: *Pteonychella perpulchra* Börner

The genus is characterized by the presence of well developed tunica to unguis. But this tunica is not comparable with that of other collembola by which all the dorsal side of unguis is covered with its thin, hyaline membrane. In contrast, it is the paired dorsolateral teeth, which are well developed, going to be continuous on the dorsum and along the sides to form a a kind of fan-like structure, just as may be seen also in *Agrenia*.

Pteronychella andina sp. n. (Fig. 3)

CHILE. Soler Glacier, between Moraine of the Glacier (2 ex. 20. Ⅻ 1982)

Body length ca. 3.0 mm., colour dark purple. Antennae and furca quite pale, legs pale on distal two segments, but coloured proximally. Head pigmented dorsally. Eyes black. Trunk is deeper on posterior half, but leaving the pale segmental margins.

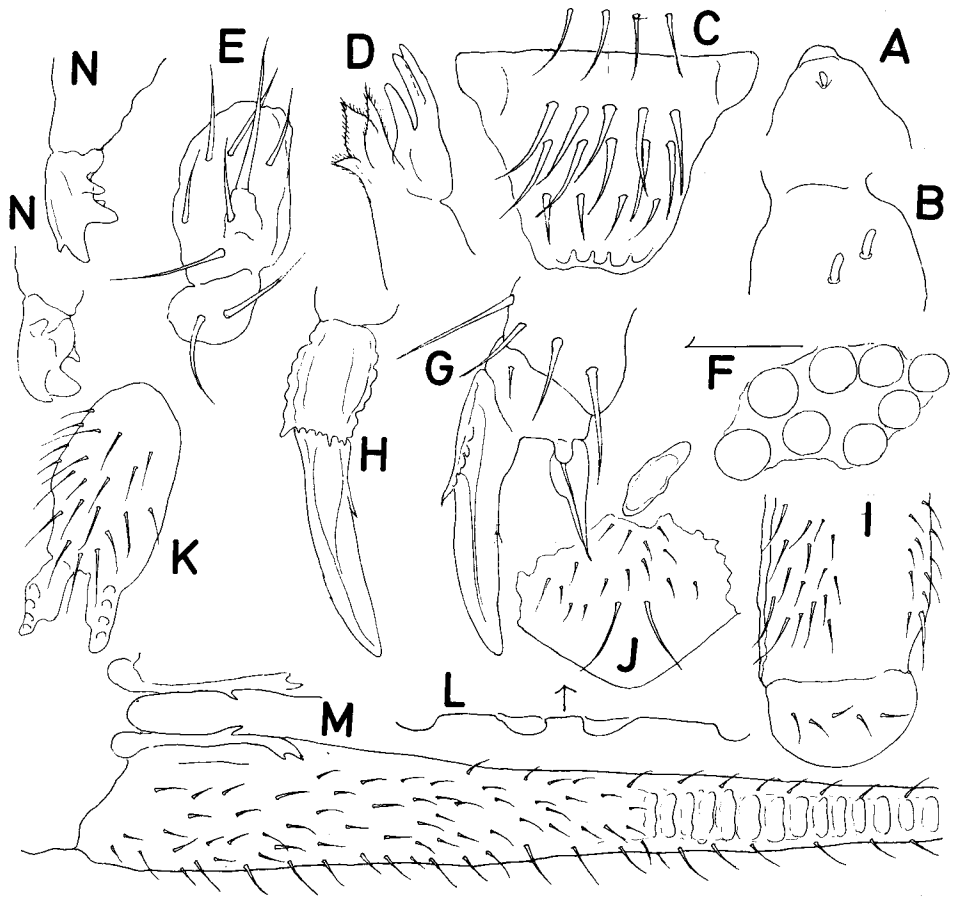

Fig. 3 *Pteronychella andina* sp. n.
A: ant. IV, B: ant. III-organ, C: labrum, D: max. head, E: outar max. lobe, F: eyes and pao. G,H: hind claw (lateral and dorsal view), I: ventral tube, J: ditto (distal part of post. side), K: tenaculum, L: marginal thickening of manubrium, M: dens (dosal), N: mucro (lat. and dors. view).

Abd.Ⅴ,Ⅵ almost pale. ant/head as 2/1, segm. ratio as 8/10/12/30. Ant.Ⅳ is with a low apical production and a small pit, but without peg seta. Ant. Ⅲ-organ is two blunt, short sensillae separately located. Ant. Ⅱ is a little clavate distally. Ant. I is with many setae, not especially modified. Labral setae 4/5, 5, 4, all setae very thick. Labral margin with 4 short ridges. Outer max. lobe with setae 2/Ⅱ+4 and, besides, with one long setula attached to the main papilla. Maxillar head with lamellae not exceeding the capitulum. Labial papillae not modified, basal median area with 10 setae, ventral groove of mentum with 3+3 setae on the sides. Eyes 8+8

subequally large. Pao. is narrowly elliptical, about 1.3 times the diameter of an eye. Unguis narrowly elongate, with one inner tooth. A pair of dorsolateral teeth is well developed to form a kind of pseudonychia covering the dorsum and sides of the unguis with the undulating margin. Unguiculus triangular, without corner tooth. Tenent hair absent. Each femur is bearing one strong seta near the proximal area, with one another such seta on hind trochanter. Ventral tube anteriorly with ca. 20+20 setae, posterior face is with ca. 50 setae, the distal one pair is stronger. Lateral flap with 5-6 setae each. Rami tenaculi quadridentate, corpus with ca. 20 setae. Furca well extended, man/d as 10/23. Manubrium ventrally setose, divided into three areas, the proximal, median and a pair of lateral distal areas, the terminal setae are not diffrentiated. Distal thickening is insignificant, rounded. Dorsally it is equally setose, leaving the median freed stripe. Dens ventrally setaceous, without proximal subsegment. Dorsally there are many, more than 60 setae just alike to *Isotomurus* spp., and crenulation begins from the middle. Mucro is complicated, quinquedentate possibly. The apical tooth is very small and obscure, the second and the third teeth are subequally large, followed by the fourth and fifth ones on both sides of the ridge, the latter is a little proximal in position. As the first and the fourth are very minute, it is easily to be mistaken as tridentate in lateral view, unless it is not confirmed by the dorsal view. Abd. V and VI are distinctly separate. All setae are smooth and there is no s. s. to be observed.

The species is near *Pt. ezonsis* Yosii, 1965 by the mucronal form, but different by the marginal thickening of manubrium. Setae of the dental dorsal setae are much more in number.

Gnathisotoma Cassagnau, 1957

Type species: *Gnathisotoma bicolor* Cassagnau, 1957

The genus is easily to be identified by the subsegment of dens on its basal part, to be seen in the ventral view.

Gnathisotoma patagonica sp. n. (Fig. 4, A-P)

CHILE. San Rafael Glacier, 700-1000 m. alt., on and in the ice, (5 ex. XII 1982,)

Body length ca. 1.8 mm. Colour intensely black all over just as *D. saltans* in outlook. ant./head as 15/10, segm. ratio as 10/18/17/30. Ant. IV is with conical production on apex and a minute pit with a pin-head sensilla, but without pinned papilla. Ant. III-organ is two small sensillae in a faint groove. Ant. I and II are with some curving setae, almost sensillate, but not in the typical form and alike to

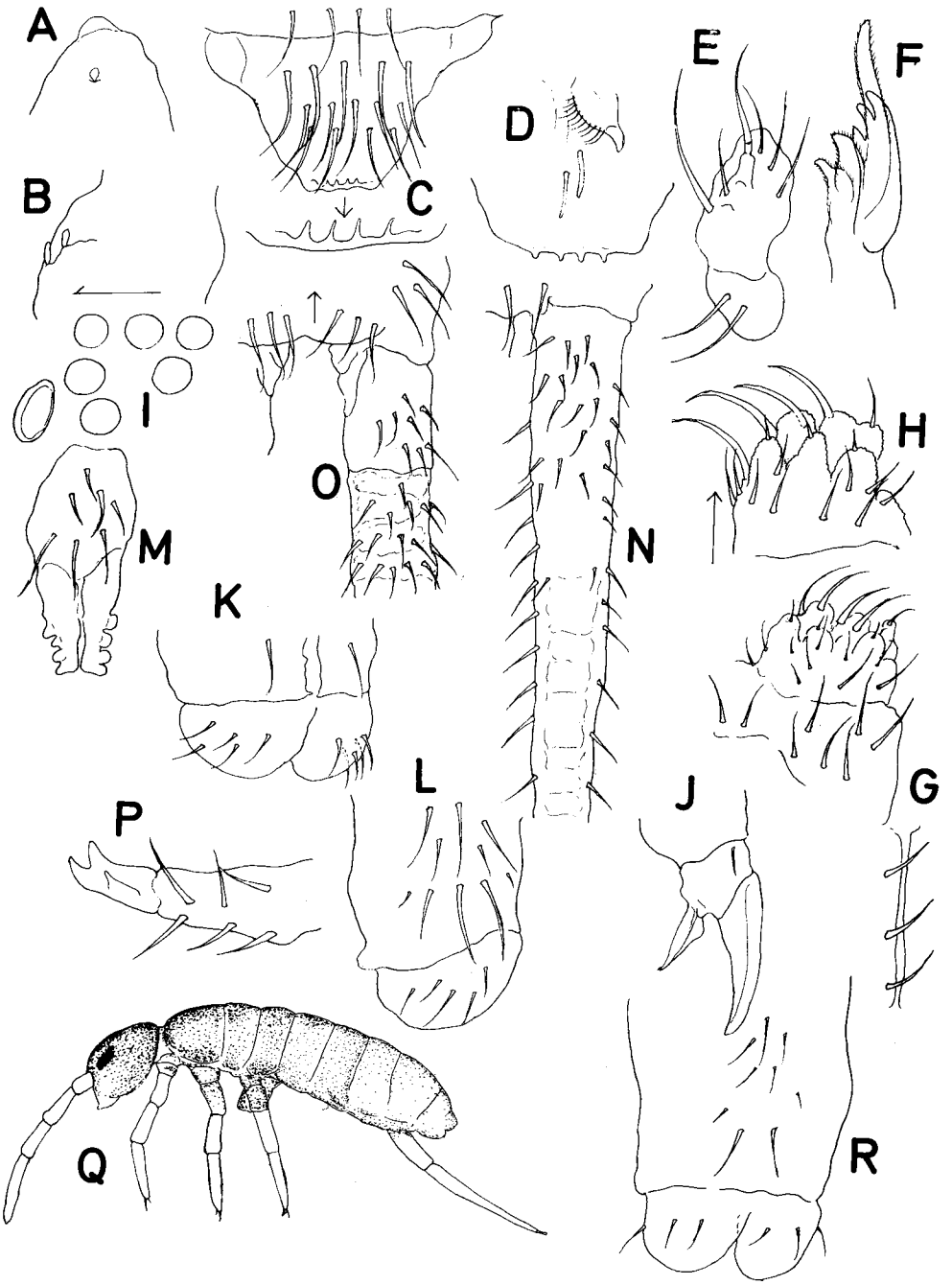

Fig. 4 *Gnathisotoma patagonica* sp. n.
A: ant. Ⅳ, B: ant. Ⅲ-organ, C: labrum, D: ditto (inner side), E: outer max. lobe, F: max. head, G: iabium and mentum, H: labial papillae, I: eyes and pao. J: hind claw, K, L: ventral tube (ant. and post. side), M: tenaculum, N: dens (dors. view), O: prox. part of dens (ventral), P: mucro.
Gnathisotoma pallens sp. n.
Q: habitus, R: ventral tube (oblique from behind).

those on ant.Ⅳ. Labral setae 4/5, 5, 4, all of them are elongate, attaining almost the labral margin, where there are 4 high, acutely undulating streaks. Outer max. lobe with setae 2/Ⅱ+3, plus one setiferous production from the main papilla. Maxillar head is with a lamella far surpassing the capitulum. Labium is deformed, i. e. the distal papillae are turned to the rounded tubercles in two rows and the setae interior to the tubercles are strongly developed to form curving, thick setae (fig. 4, H). Setae along the median groove of mentum is as 3+3. Eyes 5+5, peculiarly arranged. Pao. is elliptical, ca. 1.5 times of an eye. Legs short, unguis quite untoothed, but not elonated. Unguiculus triangular, with rounded inner lamella on basal half. Rami tenaculi quadridentate, corpus with ca. 7 setae. Furca well extended, man/d as 10/25. Manubrium is ventrally hirsute in a triangular area and distal setae are 3+3. Dorsally it is also hirsute, leaving the median freed streak and its distal setae are 1+1, but not modified. Dens is strongly converging, with a proximal subsegment, which is very clear on ventral side. Dorsallly, dens is hirsute on proximal one third, where it is smooth, followed by the crenulation, and the setae are on both sides of the stripe. Mucro is tridentate, the third one is laterally situated. Abd. Ⅴ and Ⅵ are confluent laterally, but distinctly divided on dorsal part by the presence of a transverse fold. All setae are smooth and on abd. Ⅴ the longest one is a little shorter than the segment.

The species is interesting in various respects. Firstly, by the deformation of labial papillae and secondly by the subsegmentation of dens, both of which are the characters of *Gnathisotoma*, known only from the cirque of Pyrenees, 2500 m. alt. In *G. bicolor*, however, the mucro is quadridentate and with 6+6 eyes. The resemblance to *D. saltans* is to be assumed as the convergence for the cryophilous habitat.

Possibly, *Isotoma klovstadi* Carpenter, 1902 of antarctic seems to belong to the genus *Ganathisotoma*.

***Gnathisotoma pallens* sp. n.** (Fig. 4, Q, R)

CHILE: Nar Glacier in Patagonia, 1200-1300 m. alt. (5 ex. 10. Ⅻ 1982)

Body length ca. 1.4 mm., colour grayish, antennae and furcula quite pale, legs slightly dark on coxa and trochanter only. Head and trunk are diffusely bluish pigmented, going to fade out on posterior abdominal segments. In the details of the body, including the modified labial papillae and subdivided dental basis etc., it coincides well with the foregoing *G. patagonica*, but different on the lateral flap of the ventral tube, which has 3 setae each and this may be the primary type of the genus *Gnathisotoma*. Only for this reason the species is established, as it is parallel with the pale form of the body.

***Entomobrya* (nivalis-gr.) *rohtangensis* Baijal** (Fig.5)

Entomobrya rohtangensis: Baijal 1958

NEPAL: Yala Glacier, 5000 m. alt. from the moraine hill, among Umbelliferae (5 ex. 13. Ⅸ 1985)

Body length ca. 2.0 mm,. colour yellowish white all over the body, with only a slight dark pigment on antennal basis. Antennae bluish dark, deeper distally. All other extremities pale. Antennae elongate, ca. 3.0 times the head, with segm, ratio as 5/10/13/10. Ant. Ⅳ with a bilobed apical bulb. Ant.Ⅲ-organ is two small, blunt setulae in a shallow groove. Labrum with setae 4/5, 5, 4, prelabrals smooth. Labral margin with 2+2 elongate tubercles, each with 1−2 cusps on it. Median

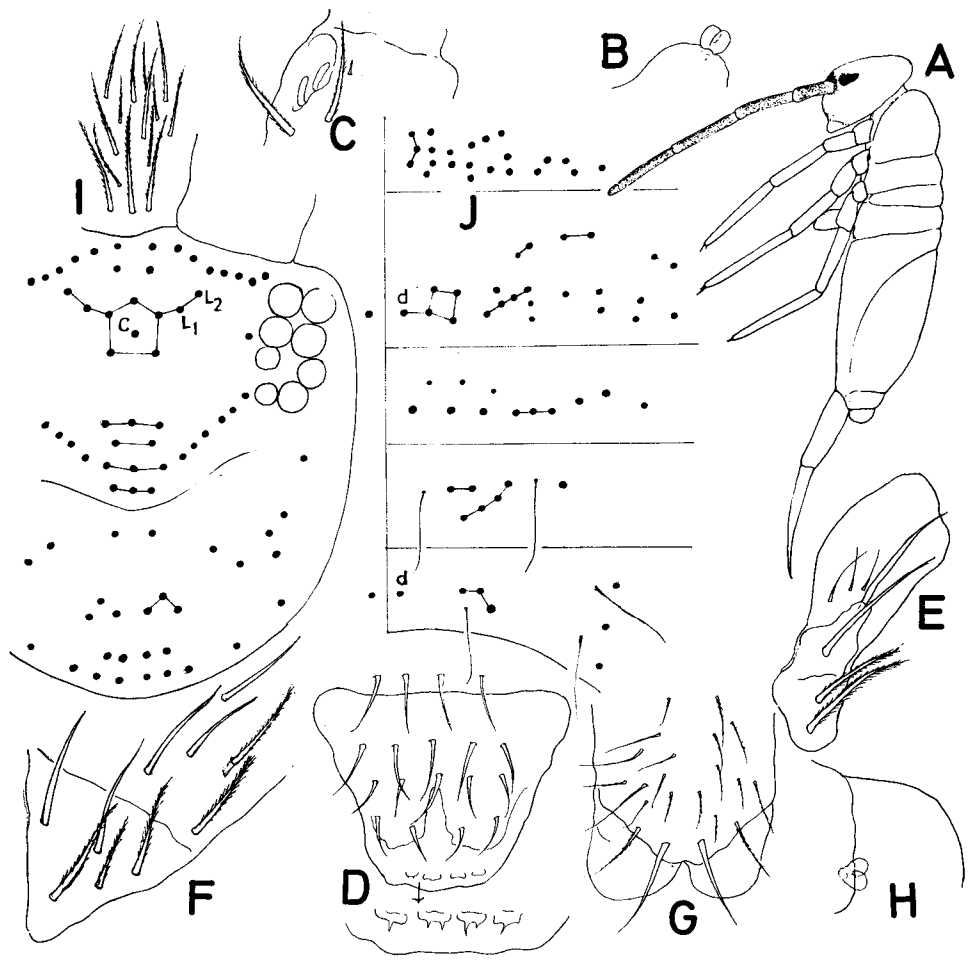

Fig. 5 *Entomobrya rohtangensis* sp. n.
A: habitus, B: ant. Ⅳ, C: ant.Ⅲ-organ, D: labrum, E: outer max. lobe, F: labium, G: ventral tube (post.), H: lateral organ of abd.Ⅴ, I, J: chaetal pattern of head and trunk.

intrusion is broadly wedge-shaped. Outer max. lobe with setae 2/II+3, basal segment with 2 barbed setae. Setae of labial basis as MRE/LL, all heavily barbed.. Unguis and unguiculus slender, but not especially modified. Tenent hair spathulate distally. Trochanteral organ is ca. 20 spiny setae in a triangular area. Ventral tube elongate, with many large and small, both ciliated setae anteriorly. Posterior side has 1+1 small, terminal and some 12+12 feeble, ciliated setae dispersed at random. Lateral flap with ca. 19 smooth setae each. Terminal tubule is smooth. Furca well extended. Man/d as 13/15. Manubrial thickening has a pair of small, cuspidate teeth at the middle. Dentes corrugated in the usual way. Mucro is equally bidentate, with a basal spine. There is a lateral organ of two small bulbs on the posterior of abd.V. Male genital orifice not observed.

On the head *area facialis* is with many ciliated setae, rather at random. *Area frontalis* has many setae, much more than it is known in *Homidia* (Yoshii 1990). Namely, there are one extra seta L-2 near L. Central seta C of the pentangle is transformed to the macroseta and there are 3 unpaired seta on the median dorsum of the V-group (fig. 5, I). Chaetal pattern of th.II, III are very many and variable, but that of abd. I-III are rather fixed, while that of IV has no transverse row of setae.

The species must belong to the *nivalis* group as abd. III has d-seta and near by s. s. of the segment is surrounded by 3 macrosetae (cf. Yosii 1971 p. 106, fig. 19B). The chaetal pattern on *area frontalis* is very peculiar, when compared with that of *Homidia*, but as we have no other data to compare it, the problem is to be postponed for further researches. Other details of the macrosetae of the trunk must be also to be discussed.

As the original description is very meager, it is identified only by the body colour and the type locality, "3500-4000 m. alt. of the western Himalaya in the alpine meadow". The species is also near *Entomobrya* (*Himalanura*) *glauca* Tschelnokov, 1977 from Tadjikstan by the body colour and by the chaetal pattern of abd. II and III, but the small seta of the trunk are not foliaceous and setae are differently arranged on abd. I.

Literature

Baijal, H. N. 1958. Survey of Himalaya part 28. *Proc. nat. Acad. Sci. India, Allahabad* 28: 349-360.

Börner, c. 1909. Japans Collembolenfauna. *Sb. Ges. naturf. Fr.* 1909: 99-135

Cassagnau, P. 1957. Faune fran aise des Collemboles VII: Un nouveau Genre d'Isotomidae de Haute Montagne. *Bull. Soc. zool. Fr.* 82 393-395

Eisenbeis, G. E. Meyer. 1986. Some ultrastructural Features of Glacier Collembola. *2nd Int. Seminar Apt. Siena*. 257-272

Fjellberg, A. 1978. New species of the genus *Isotoma* from North America. *Ent. Scand.* 9: 93-110.
———— 1979. Revision of the European species in the *Isotoma olivacea* Group. *Ent. Scand.* 10: 91-108.
———— 1987. *Proisotoma rainieri* Folsom, 1937 (=*Isotoma kisoana* Yosii, 1939) syn. nov. *Can. J. Zool.* 66: 965-967.
Kohshima, S. 1984. A novel cold-tolerant Insect found in a Himalayan Glacier. *Nature* 310: 225-227.
Yosii, R. 1939 Isotomid Collembola of Japan. *Tenthredo* 2: 348-392.
———— 1965. On some Collembola of Japan and adjacent Countries. *Contr. biol. Lab. Kyoto Univ.* 19: 1-71.
———— 1971. Collembola of Khumbu Himal. *Khumbu Himal* 4: 80-130.

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